Claims

1. Decoding method including the following steps:

a. define a source model

designed to define probabilities for x-ary symbols (S_k)associated with transitions between source states (C_k) in a source state diagram,

a so-called "product" model,

designed to define a correspondence between the x-ary symbols and first binary elements,

in relation to product states in a "product" state diagram, a product state being a function of a source state,

b. receive "channel" properties

designed to define probabilities of receiving second binary elements, upon transmission of first binary elements,

c. for a received coded flow of second binary elements,

calculate the probabilities of decoding x-ary symbols, knowing bits of the flow of second binary elements,

or the probabilities of arriving at product states knowing bits of the flow of second binary elements,

from the channel properties of the source model and of the product model,

d. reconstitute the most probable flow of x-ary symbols from the probabilities computed at step c.

2. Method according to claim 1, characterized in that the product model is defined on the basis of the source model and a transfer model designed to establish a correspondence between x-ary symbols and first binary elements in relation to probabilities associated with x-ary symbols.

3. Method according to claim 2, characterized in that the source model includes transitions associated with a correspondence between source m-ary symbols (A_k) and target x-ary symbols (S_k), in particular $m \geq x$ and $x=2$.

4. Method according to any of the foregoing claims, characterized in that the product and transfer models are of the arithmetic type and in that the transfer model is an encoding or decoding model.

5. Method according to any of the foregoing claims, characterized in that step c. includes the computation, in steps, of the probabilities of decoding an x-ary symbol knowing bits of the flow of second binary elements.

6. Method according to any of the foregoing claims, characterized in that step c. includes, for each step from a given number of steps and based on a given selection criterion, the selection of certain probabilities among the probabilities of decoding an x-ary symbol computed during a step, knowing bits of the flow of second binary elements.

7. Method according to claim 6, characterized in that the selection criterion at step c. includes a fixed number of probabilities to be retained among the highest of the probabilities.

8. Method according to either of claims 6 and 7, characterized in that the selection criterion at step c. includes a minimum threshold compared to the probabilities of receiving second binary elements, upon transmitting first binary elements, so as to store at each step only the probabilities of decoding an x-ary symbol, knowing bits of the flow of second binary elements, computed from the probabilities of receiving second binary elements, upon transmitting first binary elements, higher than this minimum threshold.

9. Method according to any of claims 5 to 8, characterized in that step c. includes the construction of a tree composed of states linked by transitions, each state corresponding to a step in the calculation of probabilities and each transition, starting from a state, corresponding to one of these computed probabilities.

10. Method according to claims 1 and 9, characterized in that step d. includes computation of the product of the probabilities corresponding to successive transitions in the tree and selection of the largest product corresponding to the most probable successive transitions and the most probable flow of x-ary symbols.

11. Method according to claims 5 and 10, characterized in that step c. includes the computation, for a given number of successive x-ary symbols to be decoded, of probabilities of decoding a sequence of x-ary symbols knowing bits of the flow of second binary elements.

12. Method according to claims 5 and 10, characterized in that step c. includes the computation, for a given number of successive bits in the flow of second binary elements, of probabilities of decoding a sequence of x-ary symbols knowing bits of the flow of second binary elements.

13. Method according to any of claims 1 to 4, characterized in that, based on the product model establishing said correspondence, step c. includes

c1. successive construction of states linked by transitions in a product states diagram from an initial state to a final state, each state defining an expected number of decoded x-ary symbols for a given number of bits in the flow of second binary elements from the initial state.

14. Method according to claim 13, characterized in that the construction of step c. includes

c2. the successive suppression of states from the product states diagram, from the final state to the initial state, for which the expected number of x-ary symbols for a given number of bits in the flow of second binary elements is different from a known maximum number of x-ary symbols.

15. Method according to either of claims 13 and 14, characterized in that step c. includes

c1. the computation, after constructing each state, of the first successive probabilities of arriving at a given state knowing past bits in the flow of second binary elements,
c2. the computation, for each state from the final state to the initial state, of second successive probabilities of observing next bits in the flow of second binary elements knowing this given state.

16. Method according to either of claims 13 and 14, characterized in that step c. includes
c3. the computation, for each state of the diagram from the initial state to the final state, of first successive probabilities of arriving at this state knowing past bits in the flow of second binary elements and, for each state from the final state to the initial state, of second successive probabilities of observing next bits in the flow of second binary elements knowing a given state.

17. Method according to any of claims 13 to 16, characterized in that step c. includes computation of the probability of arriving at this given state knowing the bits of the flow of second binary elements by determining the product of the first and second probabilities for each state.

18. Method according to claims 1 and 17, characterized in that step d. includes computation of the products of probabilities of different possible successive states followed by selection of the maximum product.

19. Method according to claims 13 and 18, characterized in that step d. includes the establishment of the flow of x-ary symbols corresponding to these successive states using the correspondence of the product model.

20. Decoder including
a first input to receive an encoded flow of second binary elements, characterized in that it includes
a second input to receive channel properties designed to define probabilities of receiving second binary elements, upon transmitting first binary elements,

a first module defining

- a source model

designed to define probabilities for x-ary symbols associated with transitions between source states in a source state diagram,

- a so-called "product" model

designed to define a correspondence between the x-ary symbols and first binary elements,

in relation to product states in a "product" state diagram, a product state being a function of a source state,

a processing module

adapted to calculate probabilities of decoding x-ary symbols,

knowing bits of the encoded flow of second binary elements, based on channel properties, of the source model and the product model, or probabilities of arriving at product states knowing bits of the flow of second binary elements,

and adapted to reconstitute the most probable flow of x-ary symbols from these computed probabilities.